

CASTILLEJA VICTORIAE (OROBANCHACEAE): A NEW RARE SPECIES FROM SOUTHEASTERN VANCOUVER ISLAND, BRITISH COLUMBIA, CANADA, AND THE ADJACENT SAN JUAN ISLANDS, WASHINGTON, U.S.A.

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ABSTRACT

Castilleja victoriae is described from the vicinity of southwestern Victoria, southern Vancouver Island, British Columbia, Canada and from San Juan Co., Washington, U.S.A. It is an annual member of subg. *Colacus* (Jeps.) T.I. Chuang & Heckard, sect. *Oncorhynchus* (Lehm.) T.I. Chuang & Heckard, formerly placed in the genus *Orthocarpus* Nutt. It is apparently most closely related to either *Castilleja ambigua* Hook. & Arn. or *Castilleja tenuis* (A. Heller) T.I. Chuang & Heckard. The new species differs primarily in its uniformly dull reddish-brown floral bracts and calyces, bicolored and unspotted corollas, and restrictive habitat requirements. Several historic populations are extirpated, and of the three extant populations only one consists of enough individuals in a protected location to be considered reasonably secure. We advocate additional surveys of its limited habitat and conservation measures to protect the species.

Key Words: British Columbia, *Castilleja victoriae*, Castillejinae, chromosome number, endangered species, new species, Orobanchaceae, Scrophulariaceae, Washington.

Specimens from a perplexing population of *Castilleja* were first collected in Victoria, British Columbia by J. Macoun in 1893 (*Macoun 722*) and were identified by him as *Orthocarpus castillejooides* Benth., a species now placed in the genus *Castilleja* Mutis ex L.f. (Chuang and Heckard 1991). Since that time, similar material was collected from nine other sites, all within 40 km of the first collection. Over the years, herbarium sheets from these collections have been variously identified in decreasing order of frequency as *O. castillejooides* (= *C. ambigua* Hook. & Arn. subsp. *ambigua*), *O. hispidus* Benth. (= *C. tenuis* (A. Heller) T.I. Chuang & Heckard), *O. pusillus* Benth. (= *Triphysaria pusilla* (Benth.) T.I. Chuang and Heckard), and *O. luteus* Nutt.

Divergent *Castilleja* populations in the vicinity of the city of Victoria were first noted in print by J. K. Henry (1915), who identified them as *Orthocarpus hispidus*, distinct from related plants found in the salt marshes of western Vancouver Island, which he identified as *O. castillejooides*. D. D. Keck (1927), in his comprehensive monograph on the genus *Orthocarpus* Nutt., followed Henry's interpretation, citing for Vancouver Island only a single collection of *O. castillejooides* (*Henry s.n.*), which is referable to *Castilleja*

ambigua, and a single collection of *O. hispidus* (*Macoun 722*), which is a collection of the new taxon described below. In unpublished herbarium annotations following the publication of his monograph, Keck annotated different collections of the Victoria plants as *O. castillejooides* (*Eastham s.n.*, DAO), *O. hispidus* (*Macoun 722*, GH), or "*O. hispidus* [unusual form]" (*Newcombe s.n.*, WS). Keck's uncharacteristic difficulty in determining these plants is further indicated by an unsigned and undated annotation on a sheet housed at CAN (*Eastham 9843*), "This (is) apparently not typical, and Dr. Keck was at first inclined to consider it as possibly a new species. However with more material he finally referred it to *O. castillejooides*". A similar annotation is found on a sheet at DAO (*Eastham s.n.*). In Keck's defense, there is no indication that he ever saw the species described here in the field, where its unique characters are best appreciated. British Columbia floras (Taylor 1974; Douglas et al. 1991) have accepted the original, published interpretations of Henry and Keck.

Despite difficulties in assigning these collections to a known taxon, botanists familiar with the unusual populations around Victoria did not further question their identity, perhaps due in part to Keck's unpublished annotations. In 2004, while examining populations of *Castilleja ambigua* on the west coast of Vancouver Island, Fairbarns concluded that plants in the vicinity of

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Victoria were indeed unique and belonged to an undescribed taxon. Fortunately, in June 2005, botanists collecting in support of a collaborative survey by the WTU Herbarium and The Nature Conservancy of the flora of the smaller islands throughout the San Juan Archipelago located the first United States population of the new species on a small islet adjacent to Lopez Island. Egger examined the new material shortly after viewing collections and photographs of the Victoria plants supplied by Fairbarns and immediately recognized their close similarity. A review by both authors of material collected from all known sites and field examination of thousands of plants in the three extant populations over two growing seasons revealed that the plants in question are distinct at the species level.

Castilleja victoriae Fairbarns and J. M. Egger, sp. nov. (Fig. 1)—TYPE: CANADA. British Columbia: vernal pool on W side of Trial Island, ca. 0.5 km from SE corner of city of Victoria, Vancouver Island, in low vegetation dominated by vernal pool annuals, slightly depressed site over shallowly buried bedrock, elev. ca. 4 m, 21 Jul 2005, Matt Fairbarns s.n. (holotype: WTU 363026; isotypes: CAN, US).

Latin diagnosis. *Castillejæ ambiguae* Hook. & Arn. similis sed bracteis et lobis calycum non valde dissimilibus a foliis, interdum viridulis proximaliter ad obscure porphyreis distaliter, interdum obscure porphyreis undique, apicibus nunquam coloratis aliter; labiis abaxialibus corollarum lenibus citrinis, non maculatis, stigmatibus persaepe inclusis intra rostra corollarum. *Castillejæ tenui* (A. Heller) T. I. Chuang & Heckard similis sed caulibus brevidecumbentibus ad ascendentibus, 5–15 cm altis, foliis ovatis ad lanceolatis, marginibus integris vel lobatis, lobis lateralibus 1 vel 2 paribus, lanceolatis, plerumque obscure rubropurpureis ad porphyreis; bracteis interdum viridulis proximaliter et obscure porphyreis distaliter, interdum obscure porphyreis undique, lobatis, lobis 3–7, lanceolatis, apicibus plerumque triangularibus, tubis et rostris corollarum plerumque lenibus albis, labiis abaxialibus corollarum lenibus citrinis, non maculatis.

Plants annual with thin, weakly developed, straw-colored taproots, usually with several lateral rootlets. **Stems** usually solitary but occasionally with 2–4 branches from the base, these occasionally branched again below mid-point, upright to weakly ascending, dull reddish-brown, 2–20 cm long in flower, bearing a mix of short, gland-tipped hairs and longer, multicellular, pilosulous hairs. **Leaves** cauline, alternate, 0.5–2.7 cm long, generally dull reddish-purple to reddish brown throughout, sometimes pale greenish proximally grading into dull reddish-purple to reddish brown distally, pubescent

throughout with a mix of short, gland-tipped hairs and longer, pilosulous hairs; lower leaves entire, lanceolate to narrowly ovate, often withering at anthesis; middle leaves 1.0–2.7 cm long, entire or more commonly with 1–2 pairs of ascending, short, lanceolate, acute-tipped lobes; upper leaves grading into the floral bracts, divided into 3–7 lanceolate lobes, these 8–12 mm long and 1–2 mm wide, generally wider and often longer than in the middle leaves, and with midlobes 1–4 mm wide. **Inflorescences** densely flowered, compact, bracteate spikes, 1–15 cm long. **Bracts** similar to upper leaves in most characters but ovate-lanceolate, usually imbricate, deeply 3–7-lobed, pale greenish proximally, quickly grading into dull reddish brown distally. **Calyces** 8–12 mm long, pale greenish throughout or pale greenish proximally, grading into dull reddish-brown distally, bearing a mix of gland-tipped and eglandular hairs, and deeply cleft into four linear-lanceolate lobes, the two primary lobes 5–6 mm long, each divided into two linear-lanceolate, acute segments, 3–4 mm long. **Corollas** bilabiate and clavate, 10–18 mm long, bicolored (yellow and white but appearing yellowish at a distance due to the prominently colored lower lips); lower lips trisaccate and somewhat expanded, about 3–5 mm long and 1–3 mm deep, with the middle lobe often infolded again creating two secondary lobes, 0.5–1.0 mm deep, soft lemon-yellow and unspotted, pubescent with a mixture of short, gland-tipped and eglandular hairs and slightly longer, eglandular, pilosulous hairs, and terminating in 3 inconspicuous whitish teeth, 0.5–0.8 mm long; beaks bilobed, lobes united to tip and enclosing the anthers, straight, surpassing the lower lip by 0.4–0.8 mm, white, very rarely with faint, diffuse purple shading, puberulent with a mix of short gland-tipped and longer eglandular hairs outside and eglandular hairs within; **stamens** four, didynamous, filaments 4.5–6.0 mm long, attached near summit of corolla tube, one pollen sac apically attached, the other versatile; stigmas entire, capitate, almost always included, minutely penicillate. **Mature capsules** slightly obcompressed, ovate-cuspidate, 5–6 mm long and 3–4 mm wide, loculicidal. **Seeds** averaging 60 per capsule (range: 37–80), short-ovoid, 0.9–1.3 mm long, stramineous and somewhat glassy, with terminal hilum; coats loose-fitting, reticulate, cells mostly polygonal-ovate, radial walls shallow, smooth or with obscure horizontal striations, inner tangential walls membranous, smooth, more or less opaque, unruptured at maturity. **Chromosome number** $2n = 24$, photographic images of pollen mother cells in diakinesis on file at WAT and WTU.

Common names. Victoria's Owl's-clover, Victoria's Paintbrush.

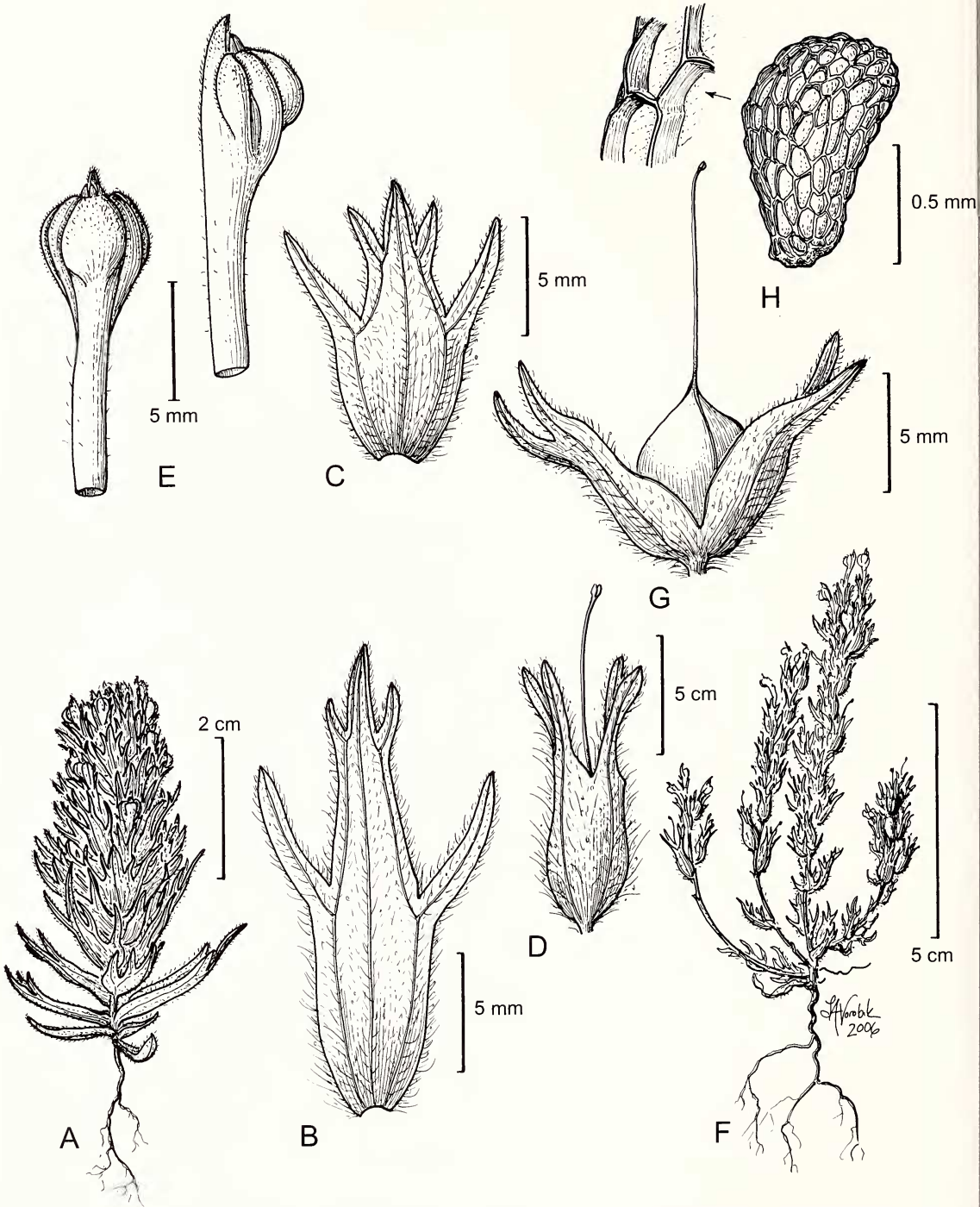


FIG. 1. *Castilleja victoriae* Fairbarns & J.M. Egger. A. Habit in flower: typical, single-stemmed plant. B. Leaf. C. Floral bract. D. Calyx, stigma and style. E. Corolla, ventral view (left), lateral view (right). F. Habit in late flower and fruit: infrequent, multi-stemmed plant. G. Partially dissected calyx and mature capsule. H. Seed with detail of seed coat. Based on Fairbarns s.n. (WTU).

Etymology and dedication. This species is named in memory of Victoria Zessin of Nebraska and Oregon, whose too brief life was a beautiful inspiration to those who knew her, and also for the city near which it was first discovered.

Additional specimens examined. CANADA. British Columbia: Vancouver Island: Victoria: Dallas Hotel, Beacon Hill, 7 Aug 1893, *Macoun* 722 (CAN, GH); "Fowl Bay" [=Foul Bay], 18 Aug 1893, *Macoun* 721 (CAN); Oak Bay, 8 Jul

1898, *Anderson 715* (V, WS), 5 Jun 1908, *Macoun 87708* (CAN, NY), 9 Jun 1919, *Newcombe s.n.* (V, 2 sheets; WS); Cattle Point, along Marine Drive, Uplands Park, 25 May 1961, *Calder & MacKay 29531* (DAO, UC, WTU), 21 Jun 1961, *Calder & MacKay 30757* (DAO, UC), 20 Jul 1966, *Harrison 90.1* (CAN, V), 5 Jun 1976 *Ceska & Ceska 27824* (V), 24 Jun 1976, *Armstrong & Armstrong s.n.* (V), 7 Jul 1993, *Ryan 63* (V); grown in pots from seed collected at Cattle Pt., 25 Jul 1975, *Armstrong & Armstrong 9* (V); Uplands Park, dry vernal pool areas near coast, 10 Jun 1960, *Melburn s.n.* (V), 22 May 1961, *Melburn s.n.* (DAO); Ten Mile Point, 21 May 1939, *Hardy s.n.* (CAS-DS, UBC, V), 12 May 1940, *Hardy & Hardy s.n.* (CAS-DS), 21 May 1940, *Eastham 7156* (DAO, UBC), 21 May 1940, *Hardy & Eastham s.n.* (CAS-DS, Uvic, V, WTU), 28 Apr 1941, *Hardy s.n.* (Uvic), 11 May 1941, *Hardy s.n.* (CAS-DS, V), 22 May 1942, *Eastham 9843* (CAN, UBC), 13 Jun 1945, *Eastham s.n.* (DAO), 13 Jun 1945, *Hardy s.n.* (V), 24 May 1954, *Melburn s.n.* (V). Shawnigan area: 8 Jun 1957, *Melburn 6162* (Uvic, 2 sheets). Greater Trial Island: 20 Jul 1976, *Ceska & Ceska s.n.* (V), 9 Jul 1981, *Ceska 6459* (V). Lesser Trial Island: 11 Jun 1953, *Hardy s.n.* (V). Chain Islands: 24 Jun 1923, *Newcombe s.n.* (V). UNITED STATES. Washington: San Juan Co.: San Juan Islands National Wildlife Refuge, in single dry vernal pool, (near Lopez Island, precise location data removed for conservation reasons), 29 May 2005, *Bellefond 05-36* (WTU).

Distribution. This new species is known primarily from the vicinity of Victoria, British Columbia (Fig. 2). The sole United States population occurs on a small island adjacent to Lopez Island, San Juan County, Washington, while all other populations occur on or adjacent to southern Vancouver Island, British Columbia. The site in the San Juan Islands is about 30 km east, directly across the Haro Strait from the Vancouver Island populations. The northernmost reported location, in the Shawnigan area, (*Melburn 6162*) is doubtful and may be based on an erroneous herbarium label, as field studies at the location described failed to discover any plants or suitable habitat.

Reproduction and phenology. *Castilleja victoriae* is an out-croser, pollinated by bumblebees (*Bombus* sp.) and perhaps other insects. Seeds appear to require a period of cold weather before they germinate. Close study of two Canadian populations revealed that neither fresh nor banked seeds germinate after late summer rains, even if temperatures remain warm (Fairbarns, unpubl. data). *C. victoriae* begins to germinate in early April, although most seedlings do not appear until late April or early May. The seedlings grow slowly in the cool, wet soil.

Mortality appears to be high among young seedlings, but most plants reaching the six-leaf stage survive until the summer dry season kills the entire cohort. Maturing plants bloom in May and June, and seed ripens in late June through July. Capsules begin to dehisce in June, and seeds are gradually dispersed through the summer and autumn, as they are shaken from the partially opened capsules. Seed dispersal ends abruptly when autumn storms break down the dead shoots. Most dispersed seeds remain close to the parent plant.

Habitat and associated species. *Castilleja victoriae* is restricted to coastal freshwater seeps and very shallow ephemeral pools on thin soil over gneissic bedrock knolls and benches. It only occurs close to the ocean, where winter frosts are light and infrequent. It is restricted to open areas where wind, salt spray, shallow soils and waterlogged conditions in winter restrict the growth of woody plants and large perennial herbaceous species. All populations occur within 1–5 m above sea level and within 50 m inland from the sea. No single species occurs consistently in the vicinity of *C. victoriae*, which suggests it is not species-specific in its presumed root hemiparasitism. This is true of most other species of *Castilleja* for which such data have been collected (Heckard 1962). Commonly associated species include *Aira caryophylllea* L., *Armeria maritima* (Miller) Willd., *Grindelia* sp., *Festuca rubra* L., *Hypochaeris radicata* L., *Lotus unifoliolatus* (Hook.) Benth., *Montia fontana* L., *Plagiobothrys scouleri* (H.&A.) I.M. Johnston., *Plantago elongata* Pursh, *Plantago maritima* L., *Prunella vulgaris* L., *Silene gallica* L., and *Trifolium depauperatum* Desv.

RELATIONSHIPS AND IDENTIFICATION

The genus *Castilleja* was formerly placed in the family Scrophulariaceae, but recent molecular studies summarized in Olmstead et al. (2001) have confirmed its placement in a monophyletic Orobanchaceae. Within the Orobanchaceae, *Castilleja* belongs to subtribe Castillejiniae G. Don. Based on morphology and duration, *Castilleja victoriae* is easily placed with the annual species of *Castilleja* subg. *Colacus* (Jeps.) T. I. Chuang & Heckard, sect. *Oncorhynchus* (Lehm.) T. I. Chuang & Heckard (Chuang and Heckard 1991). Species of this assemblage are found primarily in western North America, with a secondary radiation in the central Andes Mountains of South America (Chuang and Heckard 1991, 1992; Tank 2006) and are characterized by annual duration, pollination by insects, primarily bees, reduced corolla beak, and more or less inflated lower corolla lip. *Castilleja victoriae* occurs near the northern range limit of this

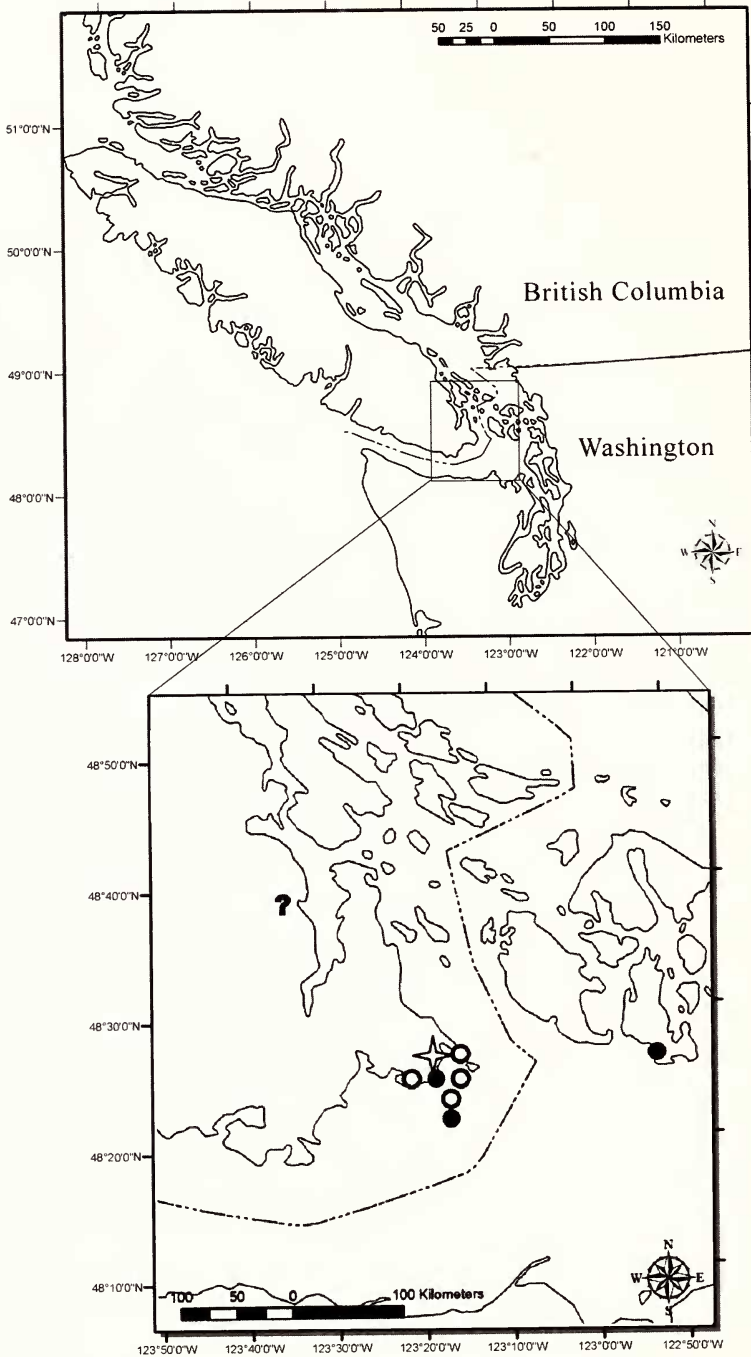


FIG. 2. Range of *Castilleja victorae* with detail showing distribution on and adjacent to southwestern Vancouver Island, Canada. Open circles indicate historic, extirpated populations. Solid circles indicate extant populations. Star indicates a recently extirpated population. Question mark indicates a doubtful collection location (see text).

species group. Preliminary phylogenetic analyses of chloroplast and nuclear ribosomal DNA sequence data indicate that *C. victorae* is most closely related to *C. ambigua* and may be recently derived from that morphologically similar species (D. C. Tank, unpubl. data).

In partial concordance with the preliminary molecular data, *Castilleja victorae* is morphologically most similar to *C. ambigua* and *C. tenuis*. It has been confused frequently with both species and shares several characters with each but in a unique combination. The similarities between

these three species are probably not due to allopolyploid hybridization, as the new species has a chromosome number of $n = 12$, the base number for this genus (Chuang and Heckard 1991). Of its relatives occurring in the Pacific Northwest, *C. ambigua*, *C. attenuata*, and *C. tenuis* are all known from counts of $n = 12$, while some populations of *C. tenuis* are also known to be polyploid, with counts of $n = 24$ (Chuang and Heckard 1982). Additional DNA and chromosome sampling of extant populations of *C. victoriae* and related species would be informative.

In the field, *Castilleja victoriae* is easily distinguished from related species, even at a distance, by its unique combination of short, compact aspect, usually single-stemmed growth form, largely uniform, "root-beer" brown herbage, floral bracts more lobed but otherwise like the leaves, without contrasting coloration on the bract tips, and distinctively bicolored, unspotted corollas (Fig. 3). These characters, along with a specialized habitat and limited distribution, assure its recognition in living populations. While the plants are far less distinctive when pressed and dried, careful examination of the inflorescence will easily separate *C. victoriae* from all but a few atypical and faded specimens of *C. ambigua* and more easily still from other related species.

Two characters are useful in distinguishing *Castilleja victoriae* from *C. ambigua* but did not fit conveniently into either the key below or the diagnosis. First, most plants of *C. victoriae* consist of a single, unbranched stem. Among specimens counted on all sheets of *C. victoriae* examined ($n = 342$ individuals), 90.4% were unbranched, and 97.4% had three or fewer stems, all of which were unbranched above the base. Of the 2.6% that contained more than three branches at the base, several were branched again between the base and mid-stem. One exceptional individual (Eastham 722, CAN) contained a total of 16 inflorescences branching from four basal stems. Photographic field data from all three extant populations confirm the predominance of single-stemmed plants in *C. victoriae* (Egger, unpubl. data). Except in one or two cases, the branching of the stems did not appear to be the result of cropping through herbivory. While the occurrence of single-stemmed plants is not unknown in *C. ambigua*, most plants of that species have numerous decumbent to ascending stems (Egger, unpubl. data). Secondly, the seed coats of *C. victoriae* are straw-colored, somewhat glassy, more or less opaque, and loose fitting. Those of *C. ambigua* are darker, more or less transparent, and tight fitting.

The following key can be used to distinguish *Castilleja victoriae* from closely related species occurring in the Pacific Northwest, north of the Siskiyou region of southern Oregon.

KEY TO THE ANNUAL SPECIES OF *CASTILLEJA*
SUBG. COLACUS, SECT. ONCORHYNCHUS NATIVE
TO NORTHERN OREGON, WASHINGTON, AND
BRITISH COLUMBIA.

1. Coloration of floral bracts strongly differentiated from leaves, almost always greenish with lobe tips strongly contrasting in color, white or less commonly yellow or pink-violet; tips of calyx lobes often strongly contrasting in color, as in floral bracts; lower lip of corollas usually marked with small reddish-purple spots near base of apical teeth; stigmas exerted from tip of corolla beak (*C. ambigua*) or included within beak (*C. attenuata*) 2
1. Coloration of floral bracts not strongly differentiated from leaves, more or less uniformly colored either entirely green, green proximally grading into dull reddish brown distally, or entirely dull reddish brown, with lobe tips not strongly contrasting in color; tips of calyx lobes never strongly contrasting in color; lower lip of corolla either entirely unspotted or with obscure, dull-reddish spots near base; stigma almost always included within corolla beak 3
 2. Plants usually much branched with stems decumbent; leaves lanceolate to ovate; bracts oblong to ovate, divided into 3-9 lanceolate lobes; lobes of lower corolla lip inflated to form pouches 3-7 mm wide; stigmas usually exerted from tip of corolla beak; in our region plants strictly limited to outer margins of tidal salt marshes or sandy hollows along coast and rarely in Puget Sound *Castilleja ambigua*
 2. Plants unbranched or few-branched from near base with stems upright to ascending; leaves more or less linear; bracts lanceolate, divided into 3 linear-lanceolate lobes; lobes of lower corolla lip slightly inflated to form pouches 1-2 mm wide; stigmas usually included within corolla beak; plants of lower elevation grasslands, meadows and openings, never in tidal salt marshes or sand dunes . . . *Castilleja attenuata*
3. Leaves linear-lanceolate with 0-5 linear lobes; bracts usually pale greenish throughout or sometimes pale green proximally grading into dull reddish-purple in the distal half, with 3-7 linear-lanceolate, narrowly acute-tipped lobes; corollas uniformly colored either white or yellow, usually with obscure, dull-reddish spots near base of lower lip; never coastal, occurring east of crest of Cascade Mountains in Washington and British Columbia *Castilleja tenuis*
3. Leaves ovate to lanceolate with 0-5 lanceolate lobes; bracts usually dull reddish-brown throughout or pale greenish proximally, becoming dull reddish brown distally, with 3-7 lanceolate, broadly acute-tipped lobes; corollas appearing yellow at distance but bicolored, with tube and beak pale white and lower lip soft lemon-yellow, unspotted, with pale white apical teeth; plants endemic to vernal moist depressions in shallow soils over rock above



Castilleja attenuata



Castilleja tenuis



Castilleja ambigua



Castilleja victoriae

FIG. 3. *Castilleja victoriae* and related species. Photographs by Mark Egger.

shoreline on islands bordering Haro Strait region of Puget Trough. *Castilleja victoriae*

CONSERVATION STATUS

Castilleja victoriae is known from only three extant populations. A fourth population, occurring in a similar situation, dwindled in numbers over the past decade and has not been seen during the past five years (through 2007), despite frequent careful surveys throughout its growing season. Four other known populations have been extirpated since the late 1800s by suburban expansion from the growing city of Victoria and resulting destruction and deterioration of habitat. As well as direct development, tourist and recreation-related activities and invasive weeds also appear to have played a significant role in the decline of this species. Extensive surveys of suitable and marginally suitable habitat at over 80 sites on and adjacent to southwestern Vancouver Island from 2003–2006 (Fairbarns, unpubl. data), as well as similar surveys in the San Juan Islands in Washington from 2005–2006 (The Nature Conservancy, unpubl. data), failed to locate any additional populations beyond those documented here.

Much of the remaining habitat suitable for *Castilleja victoriae* has been heavily altered due to invasion and overtopping by alien weeds, including several grasses (*Agrostis capillaris* L., *Aira praecox* L., *Anthoxanthum odoratum* L., *Bromus hordeaceus* L., *Dactylis glomerata* L., *Holcus lanatus* L., *Hordeum* spp., *Lolium perenne* L., *Poa annua* L., *Vulpia bromoides* (L.) S. F. Gray) and forbs (*Bellis perennis* L., *Geranium molle* L., *Hypochaeris glabra* L., *H. radicata* L., *Plantago lanceolata* L., *Rumex acetosella* L., *Silene gallica* L., *Spergularia rubra* (L.) J. & K. Presl).

In 2006, the three extant populations of *Castilleja victoriae* occupied a collective area of 600–700 m² and numbered approximately 7000–8000 individuals. Of these, many failed to produce viable seed. The great majority of these plants occur at a single site, while the other two populations numbered 164 and 31 plants, respectively. The populations are limited by suitable micro-site habitat within the species' range, as well as by apparently poor dispersal ability and recruitment. The latter factor may be at least partially due to a lack of suitable host plants in some areas, but this remains conjectural without better knowledge of which species are utilized as hosts by *C. victoriae*. The smallest population occurs in a heavily used natural area within a residential neighborhood of Victoria and is subject to trampling and disturbance by humans and domestic animals. Historically, grazing of domestic sheep in the archipelago may have also been a factor in the present rarity of *C. victoriae*.

In 2006, the authors noted instances of vertebrate herbivory in the San Juan Islands population affecting a number of individuals of *Castilleja victoriae*. Due to the manner of cropping and the isolated nature of this small island habitat, the herbivory was likely due to grazing by Canada Geese, *Branta canadensis* (L.), populations of which are rapidly increasing in this region (Kraege 2005). Herbivory by Canada Geese has also been noted by Fairbarns in the Canadian populations of *C. victoriae*. In these cases, either corollas were picked off or entire inflorescences were cropped, substantially reducing or effectively eliminating the plants' ability to set seed. Canada Geese are thought to be the cause of severe degradation in the flora of other nearby islands (P. Dunwiddie, The Nature Conservancy, personal communication, 2006). No debilitating herbivory by invertebrates was observed in any of the populations. Insects occasionally bore through floral bracts, but none of 380 capsules examined in 2002 and 2003 were perforated. No fungal damage was observed in any plants in detailed studies of two Canadian populations over three years (Fairbarns, unpubl. data).

Due to the small numbers of remaining populations and individuals, very narrow geographic and edaphic distributions, vulnerability to herbivory, habitat degradation by human activities, invasive weeds, and potential stochastic events, such as sea level changes, this species' long-term survival is at risk. *Castilleja victoriae* should be evaluated immediately for listing and protection under endangered species laws in both countries, and additional field surveys are needed, especially in the San Juan Islands of Washington.

Plants of *Castilleja victoriae* have been brought to seed successfully in the Victoria region under cultivation in pots. A sample of these cultivars is documented with a herbarium sheet (*Armstrong & Armstrong 9, V*), though the precise growing techniques employed have not been recorded. This suggests that cultivation may potentially provide an additional source of seeds for introduction in areas with suitable habitat and for other conservation purposes.

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